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Quality of western Canadian malting barley

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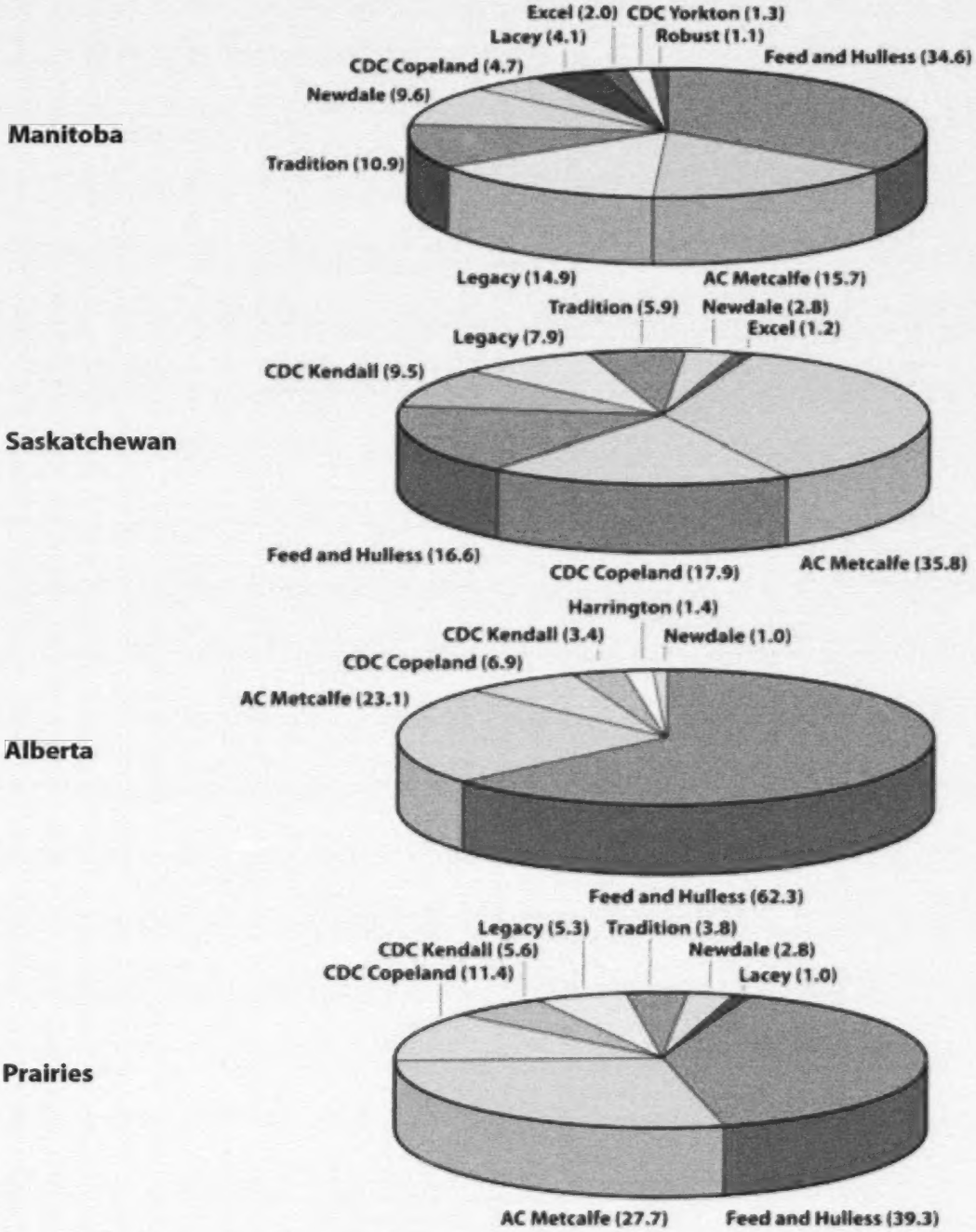
Figure 1 – Distribution of barley cultivars in 2008 by region (as a percentage of total barley seeded acreage)[1]



[1] Data obtained from the CWB Variety Survey 2008.

Quality of western Canadian malting barley 2008

Abstract

The quality data for the 2008 harvest was derived from 89 separate varietal composites, representing a total of 1 311 675 tonnes of barley selected for malting purposes.

Barley crop volume for 2008, at 10 583 000 tonnes, was very close to the 10-year average of 10 580 000 tonnes. This was largely attributable to crop yields, as seeded acreage was lower than in 2007. Barley yields, overall, were significantly higher than average.

Manitoba had an excellent year for barley crop yield due to early seeding and a long cool growing period. Levels of precipitation were above average and mid harvest period was wet. Elevated levels of fusarium, mold and mildew were present in some areas.

Southwestern Saskatchewan and southeastern Alberta lacked soil moisture entering the growing season. A cool wet spring followed, with moderately warmer and drier conditions as the season progressed. Central areas of the prairies started out cool and dry, delaying crop development, but moderate temperatures with rain later in the growing season resulted in improved crop conditions. Good harvest conditions were experienced later in the season. The Peace River district experienced near drought conditions and above average temperatures resulting in below normal yields and quality.

Malting barley selected in 2008 was of slightly above average quality. Thousand kernel weights and kernel plumpness levels were significantly higher than those of previous years. Protein levels were very good, the lowest seen in several years. Barley colour and appearance in 2008 was average. Barley germination energy levels in 2008 were slightly improved over those of 2007. Moderate water sensitivity was evident, but evidence of pre-germination was limited.

Malt made from 2008 barley was of good average quality with average levels of extract and soluble protein, adequate enzyme levels, and lower levels of wort beta-glucan and viscosity. Endosperm modification rates were consistent, allowing for good brewing performance.

Overall, the 2008 malting barley crop was of good average quality.

Introduction

The 2008 malting barley survey is the 21th consecutive survey conducted in this format. The report is dependant on receipt of representative varietal composite samples which have been selected for domestic processing or for export as malting barley. Industry participation in preparing and submitting these composites is essential for completion of a successful survey. Submitted barley samples are anlaysed for quality and then micromalted. Malt quality is analysed using ASBC standard methods of analysis.

This year's report focuses on the heritage and characteristics of the major varieties which make up the portfolio of malting barley varieties now being selected in Canada. In the past 10 to 15 years there have been significant changes in the types grown, their quality profiles, and in the varieties selected for malting purposes. (Tables 1 and 2, and Figure 1)

Table 1 – Malting barley cultivars recommended for production in western Canada by the CMBTC, its members, and others in the Canadian barley industry (2009-2010)

Recommended two-rowed malting varieties

Variety	Domestic	Export	Market outlook
AC Metcalfe	Established	Established	Stable, high demand
CDC Copeland	Established	Established	Stable demand
CDC Kendall	Established	Established	Stable demand
Newdale	Limited	Limited	Limited demand

Recommended six-rowed barley varieties

Variety	Domestic	Export	Market outlook
Legacy	Established	Established	Stable demand
Tradition	Growing	Growing	Increasing demand
Lacey	Limited	Limited	Declining demand

Table 2 – Seeded acres of malting barley cultivars (as a percentage of total area seeded to malting barley)[1]

Two-rowed cultivars	2008	2007	2004-2008 average	Six-rowed cultivars	2008	2007	2004-2008 average
AC Metcalfe	45.7	48.6	47.2	Legacy	8.8	8.7	6.0
CDC Copeland	18.7	10.0	12.8	Tradition	6.4	4.0	2.5
CDC Kendall	9.2	14.5	11.4	Excel	1.2	1.4	2.4
Newdale	4.6	3.8	2.4	Robust	0.4	1.0	2.2
Harrington	1.5	2.7	5.6	Lacey	1.6	2.0	1.2
Merit	0.2	0.6	1.6	CDC Yorkton	0.5	0.3	0.2
Other	0.6	3.8	1.0	CDC Battleford	0.2	0.2	0.2
Stein	0.0*	1.2	1.0	Other	0.1	0.2	0.2

[1] Data obtained from the CWB Variety Survey 2008.
* negligible amounts

AC Metcalfe, a cross of Oxbow x Manley, was fully registered in 1997, and was crossed by Dr. R. Metcalfe at AAFC Winnipeg, and by Dr. W. Legge at AAFC Brandon. It has higher yield and earlier maturity than Manley, with good disease resistance and lodging resistance. Malting characteristics include improved peeling resistance, higher extract levels, higher enzyme levels, low wort beta-glucan, and faster modification rates. These factors translate into good brewing performance, with fast lautering and conversion times, and suitability for use in higher adjunct brewing. AC Metcalfe is now the most popular two-rowed variety, occupying nearly 60% of all two-rowed malt barley acreage.

CDC Copeland, a two-rowed cross of WM861-5/TR118, registered in 1999, was developed by Dr. B. Harvey, Crop Development Centre, University of Saskatchewan. It is a high yielding, early maturing variety, with good resistance to disease and lodging. CDC Copeland processes easily and modifies similarly to Harrington, with similar extract and enzyme levels, but has lower levels of soluble protein, colour, and wort beta-glucan than Harrington. It has good overall brewing characteristics, and with its quality and lower modification profile, provides an excellent balance in the portfolio of malting barley varieties. CDC Copeland production levels now exceed those of CDC Kendall.

CDC Kendall, a cross of Manley x SM85221, was registered in 1999, and was developed by Dr. B. Harvey, Crop Development Centre, University of Saskatchewan. It has higher yield, average maturity, and good lodging and shattering resistance compared to standard two-rowed check varieties. CDC Kendall has good resistance to peeling, average extract and soluble protein, and higher enzyme levels. It has very low wort beta-glucan and modification similar to Harrington. CDC Kendall is seen as a suitable replacement for Harrington, but with much higher DP, which also makes it suitable for higher adjunct brewing. Improved husk retention also helps with filtration in the lautering vessel. CDC Kendall has maintained a stable production level of 11% of two-rowed malt acreage.

Newdale, a two-rowed cross of CDC Stratus/TR 236, was fully registered in 2001, and was developed by Dr. W. Legge, AAFC Brandon Research Centre. Newdale is now being grown in significant quantities particularly in the eastern half of the Prairies. It has excellent yield, is one day later than AC Metcalfe in maturity, has good disease resistance and good lodging resistance. Newdale has improved peeling resistance, increased friability, good enzyme and soluble protein levels, low wort beta-glucan, and fast modification. It also has fast conversion times and fast lautering in the brewhouse. Its very low wort beta-glucan content make Newdale attractive to brewers who experience slow runoffs and poor beer filtration.

Legacy, a six-rowed barley, a cross of Excel/Bumper/Karl/Manker, was registered in 2002, and was developed by Dr. B. Cooper, Busch Agricultural Resources Inc., Ft. Collins, CO, USA. It has very good yield potential, maturity similar to CDC Sisler, 2-3 days later than Robust, and 1 day later than Excel. Legacy has fair lodging resistance, low grain protein, and better disease resistance than most other six-rowed varieties. Malt characteristics include higher extract and enzyme levels, lower wort beta-glucan, and faster modification rates. Legacy has shown satisfactory brewhouse performance, with fast conversion times and satisfactory lautering times. Legacy's high enzyme package makes it ideal for high adjunct brewing. Legacy now occupies roughly 50% of acreage devoted to six-rowed malting barley in western Canada.

Tradition, a six-rowed barley, a cross of 6B89-2126/ND10981, received full registration in Canada in 2004. It was developed by Dr. B. Cooper, Busch Agricultural Resources Inc., Ft. Collins, CO, USA. Tradition has good yield potential, better kernel plumpness, and better lodging resistance than B1602 or CDC Sisler. Tradition has higher extract, and higher levels of DP with adequate alpha amylase levels, when compared to B1602 or CDC Sisler. Soluble protein levels are intermediate between B1602 and CDC Sisler. Tradition has satisfactory brewhouse performance, with fast conversion times and satisfactory lautering times. Its higher enzyme package makes it ideal for high adjunct brewing, similar to Legacy. Tradition, in 2007, occupied 22% of six-rowed malting barley acreage in western Canada.

Growing and harvesting conditions

The southern half of the growing region in the Prairies had poor soil moisture conditions entering the spring seeding season due to a dry 2007 growing season and below average winter precipitation. The northern part of the Prairies had received fall rainfall and above average winter precipitation resulting in adequate soil moisture reserves.

The early spring season was very cool resulting in delayed seeding in some areas and resulted in poor germination and crop emergence in early seeded areas. Moderate to heavy precipitation fell in southern areas during late-April and early May, providing much needed moisture for germination and growth of the crop. Northern areas were warmer and drier, allowing for snow melt and seeding of most of the crop by late May.

Temperatures in May and June were below normal throughout most of the Prairie region, which delayed crop development. Crop development was 10 days to two weeks behind normal entering July, but crop conditions were generally good to excellent. Moderate temperatures in July throughout most of the Prairies allowed the crops to mature with limited stress. The exception was the Peace River region where hot, dry conditions resulted in considerable crop stress, and loss of yield. In northern Saskatchewan and Alberta cooler temperatures maintained good crop conditions until rains arrived in late July and early August.

Above normal temperatures were reported throughout the Prairie growing region in August, boosting crop development and allowing harvest to begin in southern regions by the third week of August. Rain in late August and early September slowed harvest somewhat, but the return to mild temperatures throughout the rest of September allowed late seeded crops to mature and for the harvest to proceed to a rapid completion. The dry weather also helped to preserve crop quality through the end of harvest period.

Production, yields and quality

The area seeded to barley in western Canada decreased by 16% in 2008. However, yields were good, resulting in production levels equal to the 10 year average for Western Canada in 2008 (Table 3). Variable weather conditions across the prairies resulted in pockets with good yield and barley quality, and other areas where yields and quality were compromised by adverse weather. Protein and plumpness levels were at optimum levels due to moderate temperature and moisture conditions. Germination energy characteristics were good, occasionally accompanied by some water sensitivity. Colour and appearance were good on early harvested grain, while staining levels increased on later harvested barley.

Western Canadian barley showed limited damage from pre-harvest sprouting in 2008. Rapid visco analysis (RVA) indicated 50% of the crop was sound barley

(RVA values >110) with excellent potential for storage. Over 40% of the barley had moderate pre-germination (50-110 RVA units) with good potential for

storability provided appropriate conditions were used and grain moistures were low (<12%). Less than 10% of the crop was severely pre-germinated (RVA < 50), a significant improvement over recent harvests.

RVA values were similar among the two-rowed varieties tested suggesting they all had similar propensity to pre-germinate. In contrast, the six-rowed variety, Tradition, had higher RVA values (average: 128 RVA units) than Legacy (average: 98 RVA units), the only other 6-rowed variety tested extensively. Tradition is known to exhibit greater dormancy than Legacy which could contribute to the lower tendency of pre-germination in Tradition.

Table 3 – Barley production in western Canada for 2008, 2007 and the 1999-2008 average[1]

	Seeded area			Production		
	2008	2007	1999-2008 average	2008	2007	1999-2008 average
	thousand hectares			thousand tonnes		
Manitoba	312	413	419	1080	1195	1198
Saskatchewan	1538	1780	1856	4411	3945	4273
Alberta[2]	1671	1989	2012	5092	5114	5109
Total	**3521**	**4182**	**4287**	**10583**	**10254**	**10580**

[1] Statistics Canada, *Field Crop Reporting Series, No. 7*, October 2008
[2] Alberta figures include small amounts grown in British Columbia

Table 3 shows the following:

- Total seeded acreage was 18% lower than ten-year average levels.
- Total barley production in western Canada was 3% higher than 2007.
- Total production of barley in 2008 was at ten-year average levels.
- Alberta's production was unchanged on 16% fewer seeded hectares.
- Saskatchewan production increased by 12%, on 14% fewer seeded hectares.
- Manitoba's production decreased 10%, on 25% fewer seeded hectares.

Sampling and general crop quality

The 2008 malting barley survey was based on 1 311 675 tonnes of malting barley selected for purchase by Busch Ag Resources Inc., Cargill Grain Co. Ltd., Canada Malting Co.Ltd., James Richardson International Ltd., Prairie Malt Co. Ltd, Parrish and Heimbecker Ltd., Rahr Malting Ltd., and Viterra Co. Ltd. The total tonnage included in this survey represented a significant percentage of the total volume of malting barley selected in western Canada through mid-October. Some later selections, not included in this survey, may vary slightly in quality from the weighted averages.

Selectors from these companies sent separate one-kilogram composites of barley to the Applied Barley Research Unit of the Grain Research Laboratory. Composites were based upon cultivar, province or region, tonnage, and selection period. Samples were received from the beginning of harvest until the 20th of October, at which time composite sample receival was terminated.

Samples received at the GRL were kept unique, and not further composited. A total of 89 composites of selected barley, representing 6 different malting varieties, were processed in the production of this report.

Malting quality data

The 2008 malting barley harvest produced higher volumes than earlier anticipated, given the reduced seeded area across western Canada. As climatic and growing conditions improved during the growing season, so did the volume and the quality of malting barley produced. The barley, ultimately, had near optimum protein levels, with relatively high kernel weights and plumpness levels. Germination energies were good, with limited evidence of water sensitivity. Micromalting test runs indicated that minor changes to malting schedules would produce malt of good quality. Micromalting tests using the 2007 new crop malting schedule, resulted in steep out moisture levels that were slightly lower than those of 2007, indicating that the barley absorbed water at a slightly slower rate in 2008.
(See the Methods section at the end of this bulletin for the complete malting schedule).

This year's study resulted in malts with average levels of extract, moderate levels of protein modification, and low beta-glucan levels. Soluble protein, enzyme, and free amino nitrogen levels were slightly lower than average for most varieties, partially due to the low levels of barley protein, and modification rate.

AC Metcalfe

AC Metcalfe barley in 2008 had good quality characteristics. Thousand kernel weights and plumpness levels were significantly higher than in 2007 (Table 4). Protein levels were more than 1% lower than 2007 on average. Germination energy levels were good, with only a slight amount of water sensitivity evident. Barley colour and appearance were good with moderate levels of staining.

The quality of malt made from composites of selected AC Metcalfe barley was of good quality, improved overall from 2007 AC Metcalfe barley, due mainly to the low protein level and good kernel plumpness. Friability levels were lower in 2008, most likely attributable to modification rate and less protein modification. Malt extract levels in 2008 were on average, 0.7% higher than those of 2007. Beta-glucan levels in wort were lower than those of 2007. Protein modification levels were slightly lower in 2008, as indicated by lower levels of soluble protein, with wort colour levels slightly higher, and free amino nitrogen levels unchanged from 2007. Enzyme levels indicated adequate DP and alpha-amylase levels, similar to those of 2007.

Table 4 – Quality data for 2008 harvest survey composite samples of AC Metcalfe malting barley

Origin of selected samples	Manitoba		Saskatchewan		Alberta		Prairie Provinces[1]	
Crop year	2008	2007	2008	2007	2008	2007	2008	2007
Thousands of tonnes	3	10	449	226	264	169	716	405
Barley								
Physical characteristics								
1000 kernel weight, g	44.3	36.8	44.8	37.5	45.7	42.2	45.2	39.4
Heavy grade, over 6/64" sieve, %	93.3	78.5	93.5	79.9	93.6	89.1	93.5	83.7
Intermed grade, over 5/64"sieve, %	4.9	19.1	4.8	18.1	6.5	9.6	5.4	14.6
Chemical analysis								
Moisture, %[2]	12.3	11.0	10.9	11.6	11.4	13.0	11.1	12.2
Protein, %	12.5	12.8	11.7	12.9	11.5	12.4	11.6	12.7
Germination, 4 ml (3 day), %	99	97	99	98	98	96	99	97
Germination, 8 ml (3 day), %	93	91	91	97	92	97	91	97
Malt								
Physical characteristics								
Yield, %	93.4	92.7	93.3	92.7	93.1	92.8	93.2	92.7
Steep-out moisture, %	49.8	47.5	48.5	47.6	48.0	46.8	48.3	47.3
Friability, %	75.8	84.8	76.2	82.5	74.0	78.6	75.4	81.0
Chemical analysis								
Moisture, %	4.3	5.2	4.8	4.8	5.0	4.7	4.9	4.8
Wort								
Fine grind extract, %	79.6	79.2	79.8	78.7	80.0	79.8	79.9	79.2
Coarse grind extract, %	79.1	79.0	79.4	78.2	79.5	79.3	79.4	78.7
F/C difference, %	0.5	0.2	0.4	0.5	0.5	0.5	0.5	0.5
ß-Glucan, ppm	89	48	54	61	58	95	56	75
Viscosity, cps	1.45	1.39	1.43	1.39	1.43	1.43	1.43	1.41
Soluble protein, %	5.37	5.30	4.79	5.10	4.69	4.85	4.76	5.00
Ratio S/T, %	43.4	41.4	40.9	39.0	40.1	40.2	40.7	39.6
FAN, mg/L	244	225	201	205	199	191	200	200
Colour, ASBC units	4.22	2.10	2.27	2.00	2.21	2.16	2.25	2.07
Diastatic power, °L	135	151	137	149	137	141	137	146
α-amylase, D.U.	62.1	69.1	64.9	66.5	64.1	59.6	64.6	63.7

[1] Weighted average values

[2] Moisture not representative of new crop moisture levels as samples were not collected or stored in moisture-proof containers.

CDC Copeland

CDC Copeland is the second major two-rowed malting variety grown on the prairies (Table 5). Its acreages and selection rates have increased to well beyond those of CDC Kendall. The barley composites of CDC Copeland received at the GRL were of good quality. Levels of thousand kernel weight and plumpness were significantly higher than levels in 2007. Protein levels were very good, lower than those in 2007. Germination energy levels were good, with no water sensitivity evident in the composites. Barley colour, in general, was good, with only moderate levels or staining.

The malt made from composites of CDC Copeland in 2008 was of good quality. Extract and friability levels were similar to those of 2007. Beta-glucan and wort viscosity levels were low, similar to levels of 2007. Protein modification indices were moderate, with soluble protein values slightly lower than those measured in 2007. Wort colour and FAN levels were slightly lower in 2008, due to lower barley protein levels. Diastatic power and alpha-amylase levels were similar to those of 2007.

Table 5 – Quality data for 2008 harvest survey composite samples of CDC Copeland malting barley

Origin of selected samples	Manitoba		Saskatchewan		Alberta		Prairie Provinces[1]	
Crop year	2008	2007	2008	2007	2008	2007	2008	2007
Thousands of tonnes	3	5	151	97	78	116	232	218
Barley								
Physical characteristics								
1000 kernel weight, g	47.4	37.7	46.8	38.7	46.9	41.5	46.8	40.2
Heavy grade, over 6/64" sieve, %	94.5	77.8	94.1	80.7	94.2	87.3	94.1	84.1
Intermed grade, over 5/64"sieve, %	3.7	19.1	4.3	17.1	4.3	11.4	4.3	14.1
Chemical analysis								
Moisture, %[2]	10.8	10.9	11.7	12.1	11.6	12.8	11.7	12.4
Protein, %	11.4	11.8	11.3	12.2	11.3	11.6	11.3	11.9
Germination, 4 ml (3 day), %	98	97	98	97	99	96	99	97
Germination, 8 ml (3 day), %	92	97	96	95	96	97	96	96
Malt								
Physical characteristics								
Yield, %	93.5	93.0	93.6	92.2	93.6	92.6	93.6	92.4
Steep-out moisture, %	49.1	46.6	48.2	47.8	47.9	46.6	48.1	47.2
Friability, %	81.2	86.0	89.8	86.5	86.0	91.2	88.4	89.0
Chemical analysis								
Moisture, %	4.8	4.6	4.6	4.8	4.7	4.6	4.6	4.6
Wort								
Fine grind extract, %	79.4	79.7	79.3	78.7	79.2	79.7	79.3	79.3
Coarse grind extract, %	79.2	79.1	79.0	78.1	78.9	79.2	79.0	78.7
F/C difference, %	0.2	0.6	0.3	0.6	0.3	0.5	0.3	0.6
ß-Glucan, ppm	25	69	47	68	59	43	51	54
Viscosity, cps	1.42	1.40	1.43	1.41	1.43	1.41	1.43	1.41
Soluble protein, %	4.95	5.45	4.60	5.17	4.52	5.15	4.59	5.16
Ratio S/T, %	41.4	45.2	39.9	42.0	39.8	43.4	39.9	42.8
FAN, mg/L	224	223	184	210	177	203	182	206
Colour, ASBC units	2.49	2.32	2.00	2.54	1.92	2.23	1.96	2.37
Diastatic power, °L	125	122	124	125	122	129	123	127
α-amylase, D.U.	50.8	54.3	49.9	50.3	46.2	48.6	48.7	49.5

[1] Weighted average values

[2] Moisture not representative of new crop moisture levels as samples were not collected or stored in moisture-proof containers.

CDC Kendall

CDC Kendall barley in 2008 was of good average quality (Table 6). Plumpness and thousand kernel weight levels were higher than in 2007. Protein levels were very good, averaging about 1% lower than those in 2007. Germination energy levels were good, with only slight water sensitivity present in only some samples. CDC Kendall barley grown in 2008 had moderate levels of colour and staining.

Malted composites of selected CDC Kendall barley in 2008 had quality characteristics that were improved over 2007 CDC Kendall malt. Extract levels were on average 1% higher than those of 2007, with beta-glucan and viscosity levels simlar in magnitude. Soluble protein and FAN values were slightly lower in 2008. Wort colour levels were slightly higher than those measured in 2007 CDC Kendall malt. Diastatic power levels were higher than levels of 2007, while alpha-amylase levels were similar.

Table 6 – Quality data for 2008 harvest survey composite samples of CDC Kendall malting barley

Origin of selected samples	Saskatchewan		Alberta/Sask	Alberta	Prairie Provinces[1]	
Crop year	2008	2007	2008	2008	2008	2007
Thousands of tonnes	77	91	27	6	110	91
Barley						
Physical characteristics						
1000 kernel weight, g	45.5	37.8	44.7	45.1	45.3	37.8
Heavy grade, over 6/64" sieve, %	95.8	85.9	95.7	95.8	95.8	85.9
Intermed grade, over 5/64"sieve, %	2.9	12.4	3.0	3.3	3.0	12.4
Chemical analysis						
Moisture, %[2]	11.3	11.5	10.9	12.0	11.2	11.5
Protein, %	11.8	12.9	11.8	11.6	11.8	12.9
Germination, 4 ml (3 day), %	98	98	99	100	99	98
Germination, 8 ml (3 day), %	87	93	88	97	87	93
Malt						
Physical characteristics						
Yield, %	93.4	92.8	92.5	94.1	93.2	92.8
Steep-out moisture, %	48.6	48.3	48.9	48.3	48.7	48.3
Friability, %	83.3	82.8	82.3	74.8	82.6	82.8
Chemical analysis						
Moisture, %	4.9	4.8	4.6	5.1	4.8	4.8
Wort						
Fine grind extract, %	79.8	78.9	80.1	79.0	79.8	78.9
Coarse grind extract, %	79.5	78.4	79.7	78.4	79.5	78.4
F/C difference, %	0.3	0.5	0.3	0.6	0.3	0.5
ß-Glucan, ppm	47	47	43	89	48	47
Viscosity, cps	1.42	1.38	1.43	1.43	1.42	1.38
Soluble protein, %	4.82	5.12	4.87	4.60	4.82	5.12
Ratio S/T, %	40.9	39.6	41.9	37.6	41.0	39.6
FAN, mg/L	193	204	208	159	195	204
Colour, ASBC units	2.17	1.96	2.61	1.44	2.24	1.96
Diastatic power, °L	157	149	154	160	157	149
α-amylase, D.U.	64.8	66.0	63.3	55.7	63.9	66.0

[1] Weighted average values

[2] Moisture not representative of new crop moisture levels as samples were not collected or stored in moisture-proof containers.

Newdale

Newdale is included in this survey for only the second year in 2008 (Table 7). Selected tonnages of this variety are low, but show a steady increase. Newdale barley grown in 2008 had significantly higher levels of thousand kernel weight and plumpness, compared to 2007 (Table 7). Protein levels were good, more than 1.0% lower than those in 2008. Germination energy levels were very good, with no evidence of water sensitivity. Barley appearance was good, with moderate levels of staining present.

The malt made from Newdale barley in 2008 was of good quality, with similar friability values to those of 2007 malt. Extract levels were similar to those of 2007. Beta-glucan and viscosity levels were moderately low. Protein modification was moderate, similar to levels found in 2007 Newdale malt. FAN levels as well as wort colour were slightly higher than levels in 2007. Diastatic power levels in 2008 were lower on average, and alpha amylase levels were slightly higher than those in 2007. Overall, malt made from 2008 Newdale barley was consistent in quality when compared to 2007 Newdale malt.

Table 7 – Quality data for 2008 harvest survey composite samples of Newdale malting barley

Origin of selected samples	Saskatchewan[1]	Alberta[1]		Prairie Provinces[1]	
Crop year	2008	2008	2007	2008	2007
Thousands of tonnes	50	10	56	60	56
Barley					
Physical characteristics					
1000 kernel weight, g	43.2	49.6	42.0	43.9	42.0
Heavy grade, over 6/64" sieve, %	90.3	97.0	80.0	90.9	80.0
Intermed grade, over 5/64"sieve, %	7.3	1.6	17.3	6.7	17.3
Chemical analysis					
Moisture, %[2]	10.3	12.7	13.9	10.6	13.9
Protein, %	11.4	10.5	12.3	11.3	12.3
Germination, 4 ml (3 day), %	99	100	98	99	98
Germination, 8 ml (3 day), %	93	99	100	94	100
Malt					
Physical characteristics					
Yield, %	93.6	92.9	93.7	93.6	93.7
Steep-out moisture, %	48.2	48.0	45.5	48.2	45.5
Friability, %	88.2	88.1	93.2	88.2	93.2
Chemical analysis					
Moisture, %	4.7	4.4	4.5	4.7	4.5
Wort					
Fine grind extract, %	79.2	80.5	79.6	79.4	79.6
Coarse grind extract, %	78.9	80.5	79.0	79.1	79.0
F/C difference, %	0.3	0.0	0.6	0.3	0.6
ß-Glucan, ppm	64	49	68	63	68
Viscosity, cps	1.40	1.43	1.42	1.40	1.42
Soluble protein, %	4.30	4.36	4.39	4.30	4.39
Ratio S/T, %	36.5	41.6	37.5	37.0	37.5
FAN, mg/L	157	168	149	158	149
Colour, ASBC units	1.80	2.21	1.69	1.83	1.69
Diastatic power, °L	131	94	143	127	143
α-amylase, D.U.	57.4	52.7	54.9	56.9	54.9

[1] Weighted average values

[2] Moisture not representative of new crop moisture levels as samples were not collected or stored in moisture-proof containers.

Legacy

The acreage and production volume of Legacy barley continue to make it the dominant six-rowed variety grown on the Prairies. Legacy barley composites received in 2008 had thousand kernel weight and plumpness levels that were significantly higher than those of 2007 (Table 8). Protein levels were similar to those in 2007. Germination energy levels were very good, with only slight levels of water sensitivity present.

The malt made from Legacy barley in 2008 was of average quality. Friability and fine extract levels were slightly lower than those of 2007 Legacy malt. Beta-glucan levels were higher in 2008, but viscosity levels were the same as those in 2007 . Protein modification was moderate, with FAN and wort colour levels similar to those of 2007. Diastatic power levels were higher in 2008 Legacy malt, while alpha amylase levels remained constant compared to 2007.

Table 8 – Quality data for 2008 harvest survey composite samples of Legacy malting barley

Origin of selected samples	Manitoba		Saskatchewan		Prairie Provinces[1]	
Crop year	2008	2007	2008	2007	2008	2007
Thousands of tonnes	7	23	136	82	143	120
Barley						
Physical characteristics						
1000 kernel weight, g	39.0	34.1	40.7	34.4	40.6	34.3
Heavy grade, over 6/64" sieve, %	92.9	79.9	93.1	84.0	93.1	83.8
Intermed grade, over 5/64"sieve, %	5.4	18.2	5.0	14.0	5.0	14.2
Chemical analysis						
Moisture, %[2]	12.2	11.4	10.8	11.7	10.9	11.8
Protein, %	12.3	11.9	12.0	11.9	12.0	12.0
Germination, 4 ml (3 day), %	99	97	99	99	99	97
Germination, 8 ml (3 day), %	89	94	92	95	92	95
Malt						
Physical characteristics						
Yield, %	93.6	93.0	93.7	92.7	93.7	92.8
Steep-out moisture, %	48.7	46.4	47.3	47.2	47.4	46.9
Friability, %	77.7	82.3	79.5	81.5	79.4	80.9
Chemical analysis						
Moisture, %	4.1	5.0	5.0	4.6	4.9	4.7
Wort						
Fine grind extract, %	77.9	78.1	78.4	77.9	78.4	78.0
Coarse grind extract, %	77.3	77.7	77.7	77.1	77.7	77.2
F/C difference, %	0.6	0.4	0.7	0.9	0.7	0.8
ß-Glucan, ppm	201	175	328	207	322	240
Viscosity, cps	1.46	1.41	1.47	1.45	1.47	1.45
Soluble protein, %	4.99	5.05	4.88	5.02	4.89	5.07
Ratio S/T, %	40.4	42.5	40.6	42.7	40.6	43.0
FAN, mg/L	209	217	209	209	209	211
Colour, ASBC units	2.55	2.05	2.00	2.15	2.02	2.20
Diastatic power, °L	165	162	163	154	163	151
α-amylase, D.U.	59.8	58.4	59.8	60.2	59.8	59.2

[1] Weighted average values

[2] Moisture not representative of new crop moisture levels as samples were not collected or stored in moisture-proof containers.

Tradition

Tradition barley is now being grown and selected in significant quantities on the Prairies (Table 9). Selected composites of Tradition barley had good quality, with higher levels of plumpness and kernel weights than in 2007. Protein levels were good, averaging at the 12.2% level, similar to 2007. Germinative energy levels were good, however, moderate water sensitivity(or dormancy), was evident. Barley colour and staining was moderate.

Malt made from selected composites of Tradition barley in 2008 was of good average quality. Extract levels were slightly higher in 2008 compared to those of 2007. Wort beta-glucan levels were slightly elevated, possibly due to dormancy (as suggested by water sensitivity data), in barley composites. Protein modification levels were moderate, and FAN levels were adequate. Wort colour levels were relatively low, similar to 2007 malt. Diastatic power and alpha-amylase levels were good, similar to those of 2007. Tradition malt analysis data presented here, may exhibit the latent effects of post-harvest dormancy, which is characteristic of the variety.

Table 9 – Quality data for 2008 harvest survey composite samples of Tradition malting barley

Origin of selected samples	Manitoba		Saskatchewan		Prairie Provinces[1]	
Crop year	2008	2007	2008	2007	2008	2007
Thousands of tonnes	4	16	91	52	95	68
Barley						
Physical characteristics						
1000 kernel weight, g	39.1	36.4	40.1	34.5	40.1	35.0
Heavy grade, over 6/64" sieve, %	92.4	82.6	94.1	84.1	94.0	83.7
Intermed grade, over 5/64"sieve, %	6.6	15.9	4.1	13.7	4.2	14.3
Chemical analysis						
Moisture, %[2]	12.6	11.8	10.8	11.6	10.8	11.7
Protein, %	13.5	12.8	12.1	12.3	12.2	12.4
Germination, 4 ml (3 day), %	100	98	98	97	98	97
Germination, 8 ml (3 day), %	95	89	88	90	88	90
Malt						
Physical characteristics						
Yield, %	93.4	93.2	94.1	93.7	94.1	93.6
Steep-out moisture, %	49.5	46.2	47.7	46.6	47.8	46.5
Friability, %	65.5	85.7	67.4	77.1	67.3	79.1
Chemical analysis						
Moisture, %	4.5	4.9	4.9	4.8	4.9	4.8
Wort						
Fine grind extract, %	76.7	78.0	78.3	77.6	78.2	77.7
Coarse grind extract, %	76.3	76.9	77.2	76.0	77.1	76.2
F/C difference, %	0.4	1.1	1.1	1.6	1.1	1.5
ß-Glucan, ppm	105	224	369	341	358	313
Viscosity, cps	1.49	1.48	1.51	1.50	1.50	1.49
Soluble protein, %	4.53	4.79	4.55	4.54	4.55	4.60
Ratio S/T, %	33.2	37.9	37.0	37.5	36.8	37.6
FAN, mg/L	170	181	179	157	179	163
Colour, ASBC units	1.58	1.90	1.64	1.60	1.64	1.67
Diastatic power, °L	172	160	169	168	169	166
α-amylase, D.U.	47.7	49.5	49.1	44.5	49.0	45.7

[1] Weighted average values

[2] Moisture not representative of new crop moisture levels as samples were not collected or stored in moisture-proof containers.

Methods malting barley

This section describes methods used at the Grain Research Laboratory. Unless otherwise specified, analytical results for barley and malt are reported on a dry weight basis. The ASBC methods cited are those of the American Society of Brewing Chemists, Ninth Edition, (2007).

α-amylase activity

α-Amylase activity is determined using ASBC method MALT 7B automated to run on a Skalar segmented flow analyser, using ASBC dextrinized starch as the substrate, and calibrated with standards that have been determined by method ASBC Malt 7A.

ß-Glucan content

ß-Glucan content is determined in malt extract by Skalar segmented flow analysis using Calcofluor staining of soluble, high molecular weight ß-glucan (ASBC Wort-18).

Diastatic power

Diastatic power is determined on a Skalar segemented flow analyzer, using an automated neocuproin assay for reducing sugars, which is calibrated using malt standards analysed using the official ferricyanide reducing sugar method, (ASBC Malt 6A).

Dockage and assortment

Dockage - Dockage-free barley is obtained by passing an uncleaned sample through a Carter Dockage Tester arranged as described in the Canadian Grain Commission's Official Grain Grading Guide for dockage determination. This involves passing the barley over a #6 riddle, #6 and #5 Buckwheat sieves, and a #4.5 round hole sieve. Material retained above the #4.5 round hole sieve is considered to be dockage-free. **Assortment** - All samples are passed through a Carter Dockage Tester equipped with a No. 6 riddle to remove foreign material and two slotted sieves to sort the barley. Heavy Grade barley is the material retained on a 6/64" (2.38 mm) x 3/4" slotted sieve. Intermediate Grade is barley that passes through the 6/64" x 3/4" sieve but is retained on a 5/64" (1.98 mm) x 3/4" slotted sieve.

Fine-grind and coarse-grind extracts

Extracts are prepared using an Industrial Equipment Corporation (IEC) mash bath and the Congress mashing procedure from 45°C to 70°C. Specific gravities are determined at 20°C with an Anton Paar DMA 5000 digital density meter (ASBC Malt-4).

Free Amino Nitrogen (FAN)

Free amino nitrogen is determined on the fine extract according to the official ASBC method Wort-12, automated to run on a Skalar segmented flow analyzer.

Germination energy

Germination energy is determined by placing 100 kernels of barley on two layers of Whatman #1 filter paper, in a 9.0 cm diameter petri dish, and adding 4.0 ml of purified water. Samples are controlled at 20 degrees Celcius and 90% relative humidity in a germination chamber. Germinated kernels are removed after 24 and 48 hours and a final count is made at 72 hours (ASBC Barley 3C, IOB, and EBC procedure).

Kolbach index (ratio S/T)

Kolbach index is calculated from the formula, (% Soluble protein/% Malt protein) x 100.

Malting conditions

Malts are prepared using an Automatic Phoenix Micromalting System designed to handle twenty-four 500 g samples of barley per run. Samples were steeped at 13°C using the following regime; 7 hour wet steep, 14 hour air rest, 10 hour wet steep, 12 hour air rest, 2 hour wet steep, 3 hour air rest. Samples were germinated for 96 hours at 15°C, with 100% relative humidity. Kilning was carried out over 24 h as follows:12 hours at 55°C; 6 hours at 65°C; 2 hours at 75°C; 4 hours at 85°C.

Malt mills

Fine-grind malt is prepared with a Buhler-Miag disc mill set to fine-grind. Coarse-grind malt is prepared with the same mill set to coarse-grind. The settings for fine- and coarse-grinds are calibrated quarterly, based on the screening of a ground ASBC standard check malt (ASBC Malt-4).

Moisture content of barley

Moisture content of barley is predicted using NIR equipment that has been calibrated by the standard ASBC method (ASBC Barley 5C).

Moisture content of malt

Moisture content of malt is determined on a ground sample at 104°C for 3 hours in a convection oven (ASBC Malt-3).

Protein content (N x 6.25)

Protein content is predicted on dockage-free barley using NIR equipment that has been calibrated by Combustion Nitrogen Analysis (CNA). CNA is determined on a LECO Model FP-428 CNA analyser calibrated by EDTA. Samples are ground on a UDY Cyclone Sample Mill fitted with a 1.0-mm screen. A 200-mg sample is analysed as received (it is not dried prior to analysis). A moisture analysis is also performed and results are reported on a dry matter basis (ASBC Barley 7C).

Rapid Viscometric Analysis

The degree of pre-germination in barley was determined as described by Izydorczyk (2005) see www.grainscanada.gc.ca/quality_matters. Project report: prediction of germination energy of malting barley during long term storage. Grain Research Lab, Canadian Grain Commission, Winnipeg, Canada. Samples were analyzed using the RVA-4 (Newport Scientific) and the Stirring Number Program. Final viscosity values were presented in Rapid Visco Units (RVA).

Viscosity

Viscosity is measured on fine grind Congress wort using an automated Schott AVS 500 Micro-Ubbelodhe glass capillary viscometer, which has been calibrated according to ASTM method D-445 (ASBC Wort-13).

Water sensitivity

Water sensitivity is determined exactly as described for germination energy, except that 8.0 ml of purified water is added to each petri dish (ASBC 3C, IOB and EBC procedure). The actual water sensitivity value is the numerical difference between the 4ml and 8ml tests. (Note: the water sensitivity value is not reported in the data tables but is inferred by inclusion of the result of the 8 ml test).

Weight per thousand kernels

A 500 gram sample of dockage-free barley is divided several times in a mechanical divider to obtain two equal portions of 40 grams. All foreign material and broken kernels are removed from one 40 gram portion and the net weight determined. The number of kernels is then counted with a mechanical counter and thousand kernel weight is calculated (as is basis) (Institute of Brewing's Recommended Methods of Analysis, Barley 1.3 (1997)).

Wort-soluble protein

Wort-soluble protein is determined spectrophotometrically using ASBC method Wort-17.

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